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NORMAL NEURONAL CLUSTERING IN THE NECK REGION OF THE HUMAN GALLBLADDER WALL AND CORRESPONDING NEURONAL DENUDEMENT IN CHAGAS' DISEASE[1]

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ABSTRACT. Fifteen human gallbladders, 5 from normal patients (group I), 5 from Chagasic patients with cholelithiasis (group II) and 5 from Chagasic patients without cholelithiasis (group III) were studied. Perikarial counting was carried out in 3 portions of the gallbladder (neck, body and fundus), each histological sections being completely scanned and the number of nerve cells given per square millimeter. In the control group, a higher number of nerve cells is present in the neck (mean 23.45 ± 10.14) than in the body (mean 7.70 ± 8.45) and fundus (mean 5.60 ± 3.66). In the Chagasic groups with or without cholelithiasis, no nerve cells were found; few or no inflammatory cells, myositis, neuritis and perineuritis were observed in the layers of the organ. Normal gallbladders have pronounced concentration of nerve cells in the neck, compared with that of the body and fundus. Chagasic gallbladders, whether or not they are lithiasic, are completely denervated. This denervation apparently does not impair gallbladder motor function.

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INTRODUCTION

The purpose of this work is to evaluate quantitatively the nerve cells (perikarya) in 3 portions of the human gallbladder wall (neck, body and fundus) in normal patients and in patients with Chagas' disease, with and without associated cholelithiasis. The morphology and distribution of the neurons in the human gallbladder wall are described by Hermann (1952), Jabonero (1951) and Sutherland (1967). We have studied quantitatively the nerve cells' distribution in the 3 anatomical portions of the organ.

METHODS AND MATERIALS

Histological studies were carried out in 15 gallbladders: 5 from normal patients (group I), 5 from Chagasic patients with cholelithiasis (group II) and 5 from Chagasic patients without cholelithiasis (group III). In the first group there were 4 males and one female, aged 22–52 years (mean 34), 4 whites (Caucasians) and one Negro; group II, 4 females and one male, aged 21–38 years (mean 32), all whites; and group III, 3 males and 2 females, aged 19–53 years (mean 35), 4 whites and one mulatto. The last 2 groups were from endemic Chagasic areas.

In the control group, gallbladders were removed due to inadvertent damage during surgery. In 10 patients with Chagas' disease, the cholecystectomy was performed because of the cholelithiasis or traumatic lesion during cholangiography.

Each gallbladder was emptied of bile and an equal volume of 10% formalin injected in its interior. The gallbladders were immersed in 10% formalin for 3–4 days. Afterwards they were opened along their major axis, fixed on cardboard and immersed in formalin until further processing.

Each gallbladder was sectioned in 2 halves through its major axis. From 3 different areas (neck, body and fundus), a portion 1.0–1.5 cm was removed. Each portion was embedded in parafin after routine dehydration and clearing. Eight micron-thick sections were obtained semi-serially along the direction of the major axis. One out of 10 sections was mounted and stained using the trichromic Masson method. Each region yielded 100–170 sections totalling an average of 410 sections. From the 15 gallbladders, 5,960 sections were studied.

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Counting was carried out using a magnification of 100 times. Each section was completely scanned and the nerve cells' images observed and expressed by the number of perikarya per square millimeter. Isolated as well as ganglion cells were counted and considered one unit.

RESULTS

In the control group, more nerve cells were present in the neck (mean 23.45 ± 10.14) than in the body (mean 7.70 ± 8.45) and fundus (mean 5.60 ± 3.66) (fig. 1). In the Chagasic groups, with or without cholelithiasis, no nerve cells were found in the 3 portions of the gallbladder wall (fig. 2).

Although it was not the aim of this work to study the histopathological characteristics of the Chagasic gallbladder wall, no or very few inflammatory cells were observed in the layers of the organ. The same was observed about myositis, neuritis and perineuritis.

DISCUSSION

The Chagasic gallbladder walls showed complete absence of nerve cells on its neck, body and fundus, and few or no inflammatory cells, myositis, neuritis and perineuritis were observed. These findings do not explain how *Trypanosoma cruzi,* the cause of Chagas' disease, acts to destroy nerve cells. The destruction results from direct action of the parasite (Andrade and Andrade 1966, 1968 and Brasil 1959), and indirectly through its neurotoxins (Köberle 1957, 1963) or by immunological mechanisms (Santos et al. 1976). In each case, the presence of inflammatory cells would be expected (Penha-Filho and Köberle 1959), but these were not found.

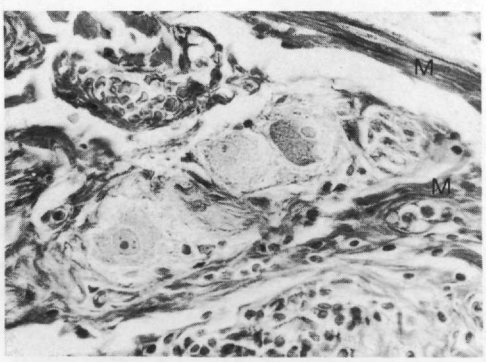

FIGURE 1. Normal gallbladder wall nerve cell (perikarya). M — smooth muscle cells 200x.

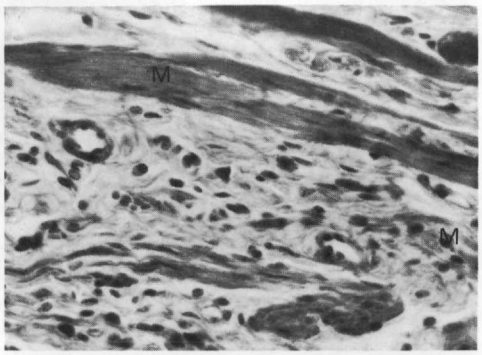

FIGURE 2. Gallbladder wall section from a Chagasic patient representative of the regions where neuronal cells normally should be found. M — smooth muscle cells 200x.

On the other hand this nerve cell destruction is present in both Chagasic groups, with and without cholelithiasis, and probably does not participate in the pathogenesis of the gallbladder stones (Makhlouf 1979, Pinotti et al. 1980). So it remains unclear as to why the incidence of cholelithiasis is higher among the Chagasic population as compared with the control one (Pinotti et al. 1980).

Total gallbladder denervation probably does not interfere with gallbladder function, as we have demonstrated in patients with megaesophagus (Pinotti et al. 1980). However, those findings must be taken cautiously, as it is well known that caerulein, like the CCK-PZ, acts directly on muscle fibers without the interference of vagal innervation (Bertaccini et al. 1968, 1969, Carratú et al. 1971, Jorpes et al. 1964, Yau et al. 1973). Thus the motor response of the gallbladder may be normal in these patients, even in the absence of nerve cells.

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